

FY15 Research & Development

Committee Recommendations – May 2015

The Commission received thirteen new proposals for R&D funding by the October 2014 deadline. The Committee met in January and sent six proposals to vetting. On May 12 the Committee reconvened to review vetting results and recommends funding for the following five projects, to be acted on by the Commission on May 21. One item of Other Business is also included.

Req #	Organization Name	Project Title	Request Amount	Committee recommends
2987	Dan River Business Development Center	Mid-IR Fiber Optic Research, Development and Commercialization Facility	\$1,500,000	\$1,500,000
2981	Halifax County IDA	Development and Commercialization of an Autonomous Water Vehicle in Southern VA	\$1,695,314	\$1,695,314
2984	Institute for Advanced Learning and Research	Package Innovation and Development Center	\$1,997,033	\$1,997,033
2980	Region 2000 Research Institute	5th Generation Nanoseptic Surfaces	\$2,000,000	\$2,000,000
2982	Southwest Virginia Higher Education Center Foundation	Low cost, high pressure, hydrogen storage vessel using steel wire overwrap (WireTough Phase 2)	\$2,000,000	\$2,000,000
Total (13 requests/5 recommendations)			\$18,082,527	\$9,192,347
Balance available before/after recommendations			\$20,824,924	\$11,632,577

Dan River Business Development Center

Mid-IR Fiber Optic Research, Development and Commercialization Facility (#2987)

\$1,500,000 requested

Executive summary provided by applicant: IRflex Corporation has installed state-of-the-art manufacturing facility in Danville, VA, to produce and market exciting fiber-optic devices targeted to the protection of aircraft against shoulder-fired missile. Fiber-optic devices have been developed for the Department of Defense (DoD) for infrared countermeasure (IRCM). But as the government reduced its spending budget, DoD has postponed the integration of our fiber-optic devices in their IRCM programs. Now IRflex has unique fiber technology and production facility to offer emerging fiber-optic devices specifically designed for the fast growing mid-infrared sensors markets. IRflex requests an award from the Tobacco Commission to develop and commercialize new mid-infrared fibers.

Research and Development Opportunity

IRflex Corporation has the only proven fiber technology to enable the transmission of mid-infrared lasers. Mid-infrared sensor technology in the spectral range of 2-10 micron is gaining importance in process monitoring, environmental analysis, oil and gas, security/surveillance applications, and the biomedical field. The company's infrared fiber provides the only feasible technology to enable transmission of mid-infrared laser to a remote location with improved flexibility, lower cost, compactness, and enhanced ruggedness. Mid-infrared fiber technology is the preferred solution to more expensive conventional technologies that

use complex and fragile packaging with free-space beam propagation through bulk optics and mirrors. The mid-infrared fiber technology is highly reliable and efficient since it has no moving parts and no precision alignment systems that are subject to vibration, shock and thermal instabilities. IRflex has the technical expertise and the production facility to develop the novel fiber-optic devices for transmission up to 10 micron.

Proof of Concept

IRflex has already developed the technology to produce high-quality mid-wavelength infrared (MWIR) fiber for transmission range 1.5-6 micron. IRflex currently offers a range of multimode and single-mode fibers with cables and connectors. There is an important need for long-wavelength infrared (LWIR) fibers in biochemical sensor market. IRflex must develop new LWIR fiber with transmission up to 10 micron. IRflex has already initiated the development of LWIR fiber. Preliminary results show long-wavelength transmission but the fiber loss needs to be reduced significantly. High baseline loss and absorption peaks are signs of impurities and inclusions. Improved distillation and purification techniques can be developed. Production equipment and processes will be customized and modified to improve the LWIR fiber optical properties. IRflex also develops custom fiber-optic devices: antireflective surface, fiber combiner, fiber switch, fiber imager, hollow-core fiber. IRflex will use specialized know-how and resources to transition from R&D prototypes to full scale commercial products.

Proposed Research and Development

1-IRflex will use the same glass fabrication equipment and the state-of-the-art-fiber draw tower to develop and perfect the LWIR fiber. The LWIR fiber has different properties and must be purified and fabricated with different processes but the same equipment. Experiments will be done to optimize the chemical compositions and process conditions for the LWIR fiber. 2-IRflex will develop a unique antireflective microstructure to reduce the high reflection loss at the fiber ends. Special silicon shims are etched with precise microstructure features, heated, and pressed against the fiber tips to stamp the microstructure pattern on the fiber. 3-Fiber-optic devices with added value will be developed and commercialized: fiber switch, fiber combiner, fiber imager. 4-Hollow-core fiber will be designed and developed to transmit extremely high-power mid-infrared laser in the hollow core. Special equipment and tools will be required to pressurize the hollow core during the fiber draw and control the fiber dimensions.

Commercial Potential

The development and commercialization of new mid-infrared fibers and added-value products for the biochemical sensor markets and military will drive the income increase. Income projection will grow from \$742 thousand in Year 1 to \$3.825 million in Year 5. This will generate 25 well-paid jobs (average annual wage of \$50.2 thousand) within five years from the award date and secure gainful employment opportunities to the region workforce. Steady hiring will follow with the income growth rate (1 additional employee per \$150,000 income increase). IRflex uses local suppliers for day-to day operations: machine shops with CNC milling centers and turning centers for high-precision mechanical parts, electrician, plumber, hardware store, general supplies. Danville Community College has been approached for tailored technical and manufacturing training. We also look for research collaborations with the Institute of Advanced Learning Research. The grantee, DRBDC, will have state-of-the-art clean room and the acquired equipment in its facility.

Intellectual Foundation

IRflex relies on chalcogenide glass fiber technology to develop and produce mid-infrared fiber-optic devices. This is the only proven fiber technology to enable transmission of mid-infrared lasers in the 2-10 micron wavelength range. The entire manufacturing process is highly dependent upon both patented processes and specialized intellectual know-how, which are central to IRflex's ability to sustain its leadership position in the infrared industry. IRflex has negotiated a license agreement with Naval Research Laboratory for its mid-infrared fiber patents. (17 patents). The license includes 17 patents on the mid-infrared fiber fabrication technology and specialized fiber-optic devices. IRflex also has one patent and two patent applications. The intellectual property on novel fiber devices covers packaging and special use of the mid-infrared fiber for our target applications. Together, this intellectual property and unique knowhow put IRflex in a strong position to become the leading manufacturer of mid-infrared fiber products in its target markets.

Staff comments: This is a second request from IRFlex, which received a \$2 million R&D grant in 2010. Funds requested in this phase are for personnel (\$894k), equipment (\$345k), supplies (\$216k) and contractual. This request presents a clear proof of concept from the work leading up to and through the previous phase one grant. IRFlex's work has also been strongly supported by federal military grants. The request clearly describes the additional products and markets that will be pursued in this phase. Outcomes are listed as 12 new jobs in the research phase (\$60k avg) and 13 additional production jobs during commercialization (\$44k avg). Outcomes in the first grant were listed as 30 new hires by 2013, but commercialization of that technology to serve military customers has been hampered by budget cuts, and current employment is less than ten. Outcomes in phase two therefore appear to overlap with the initial R&D grant as the two research phases collectively lead to commercialization, albeit now focused more on private sector customers than military. However, there is no new taxable private capital investment listed in either phase, which is the primary shortcoming of this request and resulted in this ranking fifth in scoring. The budget is very clearly-detailed and focused on tobacco region activities. Half of the \$2 million in matching funds is already approved and the other half appears likely, given the company's history of federal support. Matching funds are spread across the categories that are also requested on the Commission. A thorough business plan is provided. The company appears to be solidly rooted in the tobacco region, and while employment from phase one has not met expectations, the company shows a clear focus on new product development and new markets that could ultimately lead to the anticipated employment levels. *Note: this proposal received the third highest vetting scores in this cycle.*

Committee recommends award of \$1,500,000.

Halifax County IDA

Development and Commercialization of an Autonomous Water Vehicle in Southern Virginia (#2981)

\$1,695,314 requested

Executive summary provided by applicant: The goal of this project is to prototype and commercialize Autonomous Marine Systems' next-generation autonomous water vehicle, entitled a "Datamaran." The mission of this project is to create a robotic fleet of water vehicles that can provide customers with real-time intelligence of oceanographic data. This project will use many of the Tobacco Commission's R&D centers to design, prototype, and test the Datamarans, and will require the use of modeling and simulation, additive manufacturing, advanced manufacturing, composites, and software/network engineering. When fully commercialized, this project will bring approximately 47 high-paying, advanced-manufacturing and technical jobs to Southern Virginia.

Research and Development Opportunity

AMS' products address a need that is unfulfilled in the marine industry: inexpensive and reliable oceanographic data from remote locations that are useful for a broad spectrum of applications. The founders recognized this need from their involvement in the satellite industry where they realized that a tremendous wealth of knowledge existed in the world's oceans that could not be captured due to technology and cost limitations. A manned boat is prohibitively expensive to keep on station on the ocean for extended periods of time, so data sets are limited and locations are limited to near the coast. Drifting buoys, while cheap, are not controllable and have very low power generation. Research is needed in this sector to develop an autonomous, low-cost, low-energy, highly reliable system that can freely navigate the seas in a networking or swarming configuration and collect data for 6 months or more without maintenance or intervention.

Proof of Concept

Along with investor support, the funds from this grant will enable AMS to develop the Mark VII Datamaran. Over the last 7 years, AMS has successfully demonstrated the viability of the technology by testing prototypes of the Mark I through Mark VI. Over 100 km have been sailed autonomously and more than 50 hours on the water have been logged. The Datamaran can sail in all wind directions and many different wind conditions. Propulsion is provided by a proprietary auto-trimming rigid wingsail augmented by an electrically-driven propeller. If capsized, the boat can automatically upright itself through a patent-pending mechanism. A low-power computer autonomously sails the boat to waypoints. The hulls, sail and keel are made of fiber-reinforced composite materials that laminate a Styrofoam core. Global communication is provided by satellite and GSM transceivers. Photovoltaic panels supply power to a lithium-ion battery pack which continuously operates all instruments and actuators.

Proposed Research and Development

To fully capture the remote data-capturing market for oceanographic data, this research aims to solve two challenges in the development of the Datamaran Mark VII: 1) Increasing the reliability of each subsystem, and 2) Developing swarming capabilities of a fleet. The first objective is to optimize the reliability of the entire system by improving each subsystem such that the Datamaran Mark VII can autonomously and reliably navigate waters for 6 months. The second goal of the research is to develop navigating capabilities and peer-to-peer communication of a self-organizing fleet. A self-organizing network enables applications such as faster data collection over larger areas, re-configurable perimeters, and tracking of fast moving objects. Datamarans capable of network functions and behaviors would allow a single operator to control a fleet of thousands of boats with a single command, greatly reducing cost of operation. Meeting these R&D aims will accelerate AMS' path to commercialization.

Commercial Potential

The oceanographic observation industry is rapidly growing and is driven by energy, food, security and environmental concerns. Over \$80B is spent every year on ocean data acquisition. The low-cost nature of AMS' system means that observation and data collection can be performed where it was previously prohibitively expensive. By capturing a portion of this market, this project is projected to create approximately 47 high-skilled jobs in advanced manufacturing, software programming, and networking communication. This project will use many Tobacco-Commission-funded R&D centers for commercialization, and will strongly rely on the high-bandwidth capabilities of the MBC fiberoptic network for transport of large data sets generated by the Datamarans and communicated back to the AMS control center. AMS is already in discussion with large customers in the Energy and Defense industries who are committed to beta testing the technology for their specific data collection applications.

Intellectual Foundation

The IP of AMS is based around the utility of a lightweight, self-righting stable platform for ocean observation. AMS has one systems-level patent application in process, filed in March of 2013, which describes a self-righting sailing boat. The key of a self-righting boat is the ability to use the catamaran (1.4x as fast as a monohull) in addition to eliminating the need for ballast weight. This allows the craft to be fast, lightweight, easy to manufacture, assemble, and deploy. The patent also protects the system for automatically orienting the sail to consistently provide thrust in all wind directions without the need for tracking motors. In addition, AMS filed a provisional patent in May of 2014 regarding autonomous networks of ocean drones. The terms "Datamaran" and "Satellite for the Seas" have been trademarked. AMS's navigational code and tacking algorithms are maintained as trade secrets.

Staff comments: The proposal seeks funds to develop a seventh-generation prototype of the unmanned, remote-controlled "Datamaran", and commercialize a robotic fleet of water vehicles, providing real-time intelligence of oceanographic data. The company is targeting the oceanographic observation industry. Proof of concept includes testing of the first six generations of prototype, patent filings and detailed design drawings were provided with application. The applicant is proposing to build out a 5,500 sq. ft. prototyping space at SVAMC, purchase equipment and tooling, hire 13 design, engineers, and assembly positions during

research phases with private capital investment of \$250k. Commercialization is stated at 47 jobs (\$52k avg) and \$1 million of private capital investment. Although the company states it hopes to raise \$4 million of equity via a Series A offering in Spring 2015. A thorough business plan provides strong evidence of the technical aspects, but lacks some detail regarding manufacturing, marketing and distribution. The plan estimates 45-50 high-skilled technical manufacturing, management, engineering, and IT related jobs during commercialization. The project budget is well-detailed and milestones/deliverables are clear. The majority of budgeted costs are split equally between TICR and matching funds, although it appears that perhaps 20% of TICR funds would be used outside the region (presumably for testing on navigable bodies of water). Given the clear technical detail in the proof of concept, apparent market share potential and the prospect for significant manufacturing employment, this proposal was tied for the third-best score during staff review.

Note: this proposal received the fourth highest vetting scores in this cycle.

Committee recommends award of \$1,695,314.

Institute for Advanced Learning and Research
Package Innovation and Development Center (#2984)
\$1,997,033 requested

Executive summary provided by applicant: Synergy Packaging Systems, LLC (SPS) is seeking funding for a Packaging Innovation and Development Center to promote a new plastic packaging technology. This technology utilizes advanced manufacturing methods to produce lower cost replacements for metal cans, glass jars, high-barrier extrusion blow molded and thermoformed containers, and rigid paper/foil laminated canisters.

Research and Development Opportunity

Synergy, with its proprietary technology, research focus will be aimed at utilizing less material, less energy and less manpower, therefore producing containers at a significantly lower manufacturing cost as well as making them more sustainable while, at the same time, making a smaller carbon footprint. In particular research will be conducted around Crystallized Polyester (CPET) which provides an outstanding barrier against both desorption of product ingredients and absorption of package materials or outside elements in the environment. Additional research will be conducted around migrating continuous vacuum forming manufacturing processes into multi-layer, high-barrier container bodies. CPET cans once developed to a commercial capability will provide a more sustainable, lower cost package to the thermally processed food packager than steel or aluminum cans. The replacement market for CPET cans exceeds 40 Billion cans annually in the US and a larger number in the European Union.

Proof of Concept

Patents issued included: (US 7,568,590; US 8,137,493; US 8,097,197, US 8,313,596 & PCT WO 2004/017375) these patents explain Synergy's bi-injection Fusion Ring Technology which is the cornerstone of the Synergy's Packaging System. System. It enables top and bottom ends to be welded to container (plastic and fiberwall) bodies via a non-contacting high energy/magnetic field. Synergy Packaging has demonstrated that all plastic cans can be produced using polypropylene based barrier composite can bodies with bi-injected polypropylene based closures and ends welded on using Synergy's patented Fusion Ring technology. CPET research and development is the next step.

Proposed Research and Development

Acquire the co-extrusion capability that allows us to research how to make the basic high-barrier tube that we are going to run into the continuous vacuum former which creates the necessary shape (can or jar). Using our proprietary technology we will produce CPET bi-injection molded closures researching how to make them "easy-opening" and "more user friendly". Additional efforts will be to ensure the 'drop-in' replacement with market will be well-received. Evaluate and manipulate tri-layer CPET based structure that

minimizes modular stiffness while improving impact properties on the outer layers while maintains strength and rigidity of the center layer. Oxygen permeability and moisture vapor transmission levels will be thoroughly researched and defined.

Commercial Potential

CPET cans once developed to a commercial capability will provide a more sustainable, lower cost package to the thermally processed food packager than steel or aluminum cans. The replacement market for CPET cans exceeds 40 Billion cans annually in the US and a larger number in the European Union. Completing the development of CPET can bodies and ends is one of the goals of the development activity of this project. The goal would be for the Packaging Innovation and Development Center to employ 38 people by the end of Year 3. The long-term goal would be to establish a manufacturing facility in the footprint that would employ over 75 people by the end of Year 5.

Intellectual Foundation

Patents issued included: (US 7,568,590; US 8,137,493; US 8,097,197, US 8,313,596 & PCT WO 2004/017375). Additional intellectual property is expected to be developed.

Staff comments: This proposal seeks funds for equipment to accomplish further development of new plastic packaging technology as replacements for metal cans, glass jars, high-barrier extrusion blow molded and thermoformed containers, and rigid/foil laminated products. Research will focus on crystallized polyethylene (CPET) which can be lower cost to steel and aluminum. Job creation during research phase is listed as 38 (\$55K avg) with capital investment of \$2 million. Commercialization is estimated to entail 75 manufacturing jobs (\$55K avg) with \$3 million investment. Matching funds will support \$1.55 million of additional equipment, \$450K property and improvements, and ~ \$1 million for operating costs including all personnel. A thorough business plan provides strong evidence of the technical aspects, but lacks detail regarding manufacturing, marketing and distribution. the company volunteers equity in the form of stock in Synergy Packaging Systems in exchange for the Commission's financial support (p. 3 of business plan). The project budget is well-detailed (TICR funds are entirely for equipment) and milestones/deliverables are clear. Given the clear technical detail in the proof of concept, the strong industry experience of the company leaders, established patents, apparent market share potential and the potential prospects for significant manufacturing employment, this was the highest scoring proposal in the staff review. *Note: this proposal received the second highest vetting scores in this cycle.*

Committee recommends award of \$1,997,033.

Region 2000 Research Institute

5th Generation Nanoseptic Surfaces (#2980)

\$2,000,000 requested

Executive summary provided by applicant: NanoTouch Materials invented and has successfully manufactured the first and only products in the world with surfaces that are NanoSeptic. The NanoSeptic surface continuously kills bacteria, viruses and fungi using material science and nanotechnology instead of chemicals, diluted poisons or heavy metals, and does not contribute to antimicrobial resistance (superbugs). The initial product line consists of peel & stick NanoSeptic skins for door handles and NanoSeptic mats for home, business, education and travel. With infectious disease outbreaks in the news almost daily, timing is perfect for products which provide cleaner places to touch or rest items.

Research and Development Opportunity

The first four generations of the NanoSeptic surface resulted in solid proof of concept, a fully developed initial product line, and efficacy sufficient to develop pilot sales. Research and development of our 5th generation of NanoSeptic surfaces will provide tremendous market opportunity and growth. First, if the

effectiveness of the surface can consistently provide a 3-5 log reduction in microbes, additional interest will be developed in the market, and especially in healthcare, senior care and child care industries. Also, R&D focused on advanced manufacturing equipment and processes will provide a fabrication line that delivers consistent, scalable results. And finally, pursuit of EPA registration by working with our independent lab, EPA/FDA consultants and EPA staff will result in the creation of custom test protocols which could allow the NanoSeptic surface to be the first technology of its kind to be approved for health claims.

Proof of Concept

NanoTouch Materials has spent more than 3 years of research, product development, and fabrication process development, creating the first four generations of the NanoSeptic surface. These initial generations provided advancement in the following areas:

- 1.Generation 1 - early proof of concept utilizing basic photocatalytic technology, a woven-fabric substrate, and a residue-free adhesive.
- 2.Generation 2 - new advances in substrate providing a waterproof surface that can be cleaned without affecting the print or efficacy
- 3.Generation 3 - addition of compatible non-adhesive backed substrates to serve as mats and portable applications
- 4.Generation 4 - advances in primers, protective coatings, and fabrication techniques to improve durability and functional life

Proposed Research and Development

1. Research the effect of doping the current nanotechnology with new elements. Research new primers that enhance the efficacy of the nanotechnology and durability in various environments.
- 2.Develop and implement advanced manufacturing processes, equipment and automation for fabrication of the new and improved material science and technology (see #1 above). Add employees with an increasing demand on higher-skilled labor to execute necessary tasks due to process automation and proprietary processes.
- 3.Conduct iterative testing throughout the research and development process to provide constant guidance and improvement. And conduct verification tests which can be published, influencing purchasing decisions in each of our target markets.
- 4.Advance the state of photocatalytic technology to provide increased efficacy, improved low-light performance, and the development of a "healthcare grade" surface by doping the nanotechnology with various additives. This would be the first surface of its kind to seek EPA approval to make health claims.

Commercial Potential

While there is obvious potential for sales in the US, NanoSeptic products have great potential to improve public health worldwide. In 2014, four press releases resulted in web traffic and distributor inquiries from more than 60 countries. To date, NanoTouch Materials has signed distribution agreements in 22 countries outside the US. Just three of these agreements have resulted in the receipt of \$140,000 in deposits and almost \$3.5M in projected purchases over the next 2 ½ years. Because NanoSeptic products have a low retail price of \$1 to \$25, they cross most demographic barriers. Because they are simple to use and their function is easy to understand, they cross cultural barriers. People universally want to live in a healthier environment and avoid infectious diseases, and NanoTouch can help provide that benefit, concurrently delivering tax, employment and capital investment growth within the region.

Intellectual Foundation

NanoTouch filed a provisional patent application in December of 2011 and followed up with a final utility patent application a year later. Representative Goodlatte's office did reach out to the PTO on our behalf to get a status update, and the first office action is expected sometime around mid-2015. The patent application was written with additional innovation in mind. With approval of the current patent application, NanoTouch will be free to adjust ingredients and antimicrobial technology, along with primers, coatings, substrates and adhesives. NanoTouch also successfully registered the trademarks NanoTouch and NanoSeptic. The term NanoSeptic will be marketed to become the "Xerox" or industry standard in self-cleaning surfaces.

Staff comments: Funds are requested to assist the private beneficiary, which currently is housed at CAER, in developing its fifth generation product. Products are targeted to the health care, senior care, and child care industries to include travel mats for hospitality industry and business traveler, snack mats for education, counter mats for reception desks, place mats for food service, etc. Patent documents were filed in December 2011, with action expected in mid-2015. Research involves adjusting ingredients and antimicrobial technology, and further researching primers, coatings, substrates, and adhesives. Funds will be used to develop a fabrication unit for consistent and scalable product production. Funds are specifically requested for personnel (\$995k), contractual (\$265k), continuous (\$242k), equipment (\$165k), property/plant (\$222k), materials (\$110k) etc. It appears that an undetermined amount of requested personnel funds may be for company operations that are not R&D funding priorities, such as customer service, order fulfillment, sales/marketing (R&D policies restrict grantees to using no more than 10% of TCR funds for general and administrative purposes). A strong business plan is provided, with the notable lack of detail on production/manufacturing expenses. The applicant provides evidence of the commitment of matching funds from a bank and corporate investor. Outcomes are listed as 12 jobs (\$50k avg) and \$850k private investment in the research phase. Commercialization outcomes are listed as 37 jobs (\$36k avg). No commercialization phase private investment is listed, beyond amounts shown as required matching funds. While this proposal ranked 2nd in Staff scoring due to clear proof of concept and prototypes, committed matching funds, and creation of new jobs, Staff believes the budget can be reduced to focus on the necessary research steps. *Note: this proposal received the fifth highest vetting scores in this cycle.*

Committee recommends award of \$2,000,000 contingent on manufacturing of the Nanoseptic products within the tobacco region.

Southwest Virginia Higher Education Center Foundation

Low cost, high pressure, hydrogen storage vessel using steel wire overwrap

(WireTough Phase 2) (#2982)

\$2,000,000 requested

Executive summary provided by applicant: WireTough successfully completed a Phase 1 TIC award. It has grown sales from zero to cash flow positive. Recently the DOE awarded \$2MM to WireTough to develop the hydrogen storage cylinders. WireTough wishes to conduct applied R&D to expand on its existing technology platform. WireTough intends to make cylinders that (1) hold gases at much higher pressures -- up to 13,000 PSI and (2) are substantially larger in volume than cylinders in WireTough's current product line. These cylinders will be sold for storage of natural gas and hydrogen at fueling stations, and for transporting large volumes of gas.

Research and Development Opportunity

There is an opportunity to use WireTough's Virginia-made products as the platform for storing hydrogen and natural gas at high pressure and high volumes. This work will require nearly quadrupling the pressure at which WireTough's cylinders can store gas, and increasing their size. Necessary to achieve this is a source of larger cylinders (Russell County supplier), certification of the larger cylinders, adaption of higher strength steel wire previously invented in part by WireTough's CEO, and study of the effects of hydrogen on liners and steel wire wrapping steel compositions. The DOE is contributing a \$2MM grant to WireTough to partially fund this effort.

Proof of Concept

The proof of concept of wrapping high strength wires on low alloy steel liner has mostly been proved by WireTough's Phase 1 project, and the company's successful entry into the Compressed Natural Gas (CNG)

cylinder market at 3600 PSI. We have successfully made cylinders for up to 5000 PSI. 13000 PSI is achievable with our current capabilities and adequate funding.

Proposed Research and Development

Modify existing production machine to work with larger cylinders. Obtain ASME certification for 5000 PSI (pounds per square inch) stationary storage cylinders. Produce and manufacture high pressure (13000 PSI) and high volume storage cylinders. Optimize manufacturing process, including steel wire creel set up for larger cylinders, wrapping process, application of epoxy, and curing.

Commercial Potential

By being able to produce the highest pressure cylinders at the lowest cost, WireTough will garner the lion's share of the multi-billion dollar market for high pressure storage of natural gas, hydrogen and other gases. See business plan for more details.

Intellectual Foundation

The process is proprietary and two US patents are pending. Wiretough has been manufacturing these tanks for the storage of CNG on-board a vehicle for last 3 years. Certain processes, for example curing and finishing are proprietary and has given the company advantage on quality and performance.

Staff comments: The SVHEC Foundation and WireTough received a phase one grant of \$521k in 2010 that was critical in securing in mid-2014 a USDOE grant of \$2 million that is underway and will serve as the majority of the required matching funds. WireTough also states it will invest \$750k of its own funds in operations and facility. Funds are requested in this second phase for personnel (\$700k), materials (\$495k), equipment (\$375k), site improvements (\$280k) and contractual (\$150k). Outcomes are listed as five jobs (\$60k avg) and \$3 million private investment in this second research phase, and 30 jobs (\$60k avg) with \$5 million private investment during commercialization. Outcomes appear to overlap with the initial R&D grant as the two research phases collectively lead to commercialization. A 20,000 square foot expansion is budgeted at \$240K. If funding is approved, the question of whether this would be done at the company's current leased space or at an alternate site must be addressed cautiously. The proposal clearly states defined products and markets that are complementary to the DOE-funded research, and the company's success in securing DOE supports validates the technology that is under development. The company has demonstrated progress in developing its technology, securing substantial federal matching funds, and the potential for significant commercialization employment and investment. *Note: this proposal received the highest vetting scores in this cycle.*

Committee recommends award of \$2,000,000.

OTHER BUSINESS

Wise County Industrial Development Authority

Appalachia America Energy Research Center (#1840)

Approved for \$750,000 in July 2009

This R&D grant to provide operating funds for AAERC has a remaining balance of more than \$500,000. AAERC originally housed NanoQuantics, a FY2011 R&D grantee who subsequently ceased operations in Wise County. AAERC now houses Micronics Technologies, which was funded by an R&D grant in 2014 to UVA-Wise. A previous grant extension was provided by the R&D Committee, and the Wise IDA now requests further extension to continue supporting operating costs, maintenance, and electrical upgrades required by the current occupant.

Committee recommends a one year extension to July 31, 2016 for eligible operating costs and building upgrades.